Remarks

The specification has been amended to correct minor typographical errors.

Claims 1-15 were previously pending in this application. By this amendment, Applicants have amended claims 1-3, 7, 9 and 13-14.

Independent claim 1 has been amended to further recite, in part, that the controller is connected to a drain port and provides a control signal, responsive to a detected amount of the second material in the mixture being greater then the desired concentration, to dispense a portion of the mixture out the drain port. Accordingly, the language of dependent claim 3 has been amended to coincide with claim 1. Support for this amendment is provided throughout Applicants' application as originally filed, for example at page 11, lines 23-32 and at page 15, lines 9-18.

To avoid any ambiguity, independent claim 13 has been amended to positively recite the recirculation line. Claim 13 has also been amended to recite, in part, that a rate at which the second component is added to the blend chamber is adjusted to achieve a first desired concentration of the mixture for a first predetermined period of time and a second desired concentration of the mixture for a second predetermined period of time. Support for this amendment is provided throughout Applicants' application as originally filed, for example in FIG. 6.

In claim 9, the words "knowing" and "concentration" have been changed to "measuring" and "materials." In claim 10, the phrase "without using a mass flow controller" has been changed to "without measuring a mass flow rate of the first and second materials." Claim 14 has been amended to recite, in part, "means for correcting a batch of the mixture during operation of the system." The amendment is supported by original claim 14. Claim 15 has been amended to recite, in part, means for adjusting the rate at which the first component is added to the blend chamber allowing the mixture to reach a concentration lower than the first desired concentration." This amendment is supported by the specification at page 11, lines 22-32.

With respect to claim 10, the office action pointed out that this claim included a "negative limitation" and referred to MPEP Section 2173.05(i). Although it would appear that the Examiner has satisfied himself that such a limitation is supported in Applicant's original disclosure (by virtue of the lack of any rejection of this claim under 35 U.S. C. §112, first

PAGE 12/24 * RCVD AT 11/9/2005 4:33:43 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/34 * DNIS:2738300 * CSID: * DURATION (mm-ss):09-36

paragraph), Applicants note that other drawbacks involving mass flow controllers are described elsewhere in Applicant's original disclosure, for example, at pages 1-2 and 4.

Applicants have added new independent claim 21 and new dependent claims 16-20 and 22. As a result, claims 1-22 are pending for examination with claims 1, 7, 13 and 21 being independent claims. No new matter has been added.

Rejection Under 35 U.S.C. § 102(b)

The Office Action rejected claims 1-3, 6, 7-12 and 13-15 under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 3,161,203 to Hathorn et al. (hereinafter "Hathorn"). Although Applicants disagree with this rejection, claims 1 and 13 have been amended to more clearly patentably distinguish over Hathorn.

Hathorn is directed to a method and apparatus for blending oil and sand constituents for flow through a conduit system in hydraulic fracturing of earth formations. (Col. 1, lines 10-15). The liquid component enters blending receptacle 3 via conduit means 4 and the solid component enters blending receptacle 3 via conduit means 5. (Col. 2, lines 61-66). A portion of the composite medium is reintroduced into blending receptacle 3 along first and second branch conduit means 12, 17 to obtain uniform and complete suspension of the solid component without mechanical blending devices. (Col. 3, lines 15-17, 26-29; col. 4, lines 52-54, 65-69).

Density meter 13 of Hathorn, installed in second branch conduit means 17, measures the density of the composite mixture and transmits a signal to a controller 14 which, in turn, transmits an operating signal to valve positioner 15 which determines the position of valve 16 to regulate the rate at which the solid component enters blending receptacle 3 in order to maintain a predetermined density level of the composite mixture provided to well head 7. (Col. 3, lines 26-41).

In Hathorn, "the flow of the liquid component entering the system, which is determinative of the solid component inflow, is regulated to maintain the combined component inflow entering the system equal to the medium outflow." (Col. 2, lines 17-20; col. 4, lines 10-20). A liquid level measuring cell 18, positioned in blending receptacle 3, issues a pneumatic signal proportional to the deviation of the medium level from a predetermined point to a second controller 19 which, in turn, transmits an operating signal to valve positioner 20 which

PAGE 13/24 * RCVD AT 11/9/2005 4:33:43 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/34 * DNIS:2738300 * CSID: * DURATION (mm-ss):09-36

determines the position of valve 21 to cause the inflow rate of liquid component along conduit means 4 necessary to maintain the predetermined level within blending receptacle 3. (Col. 3, lines 59-67).

Hathorn fails to disclose, teach, or suggest a system as recited in amended claim 1 comprising both a drain port and an outlet. Further, Hathorn fails to disclose, teach, or suggest a system as recited in amended claim 1, wherein a controller provides a control signal responsive to a detected amount of the second material in the mixture being greater than the desired concentration, to dispense a portion of the mixture out the drain port. As noted above, Hathorn doesn't even have a drain port. One advantage of the present invention, is that the mixture is not dispensed unless the mixture is at the desired concentration. As such, the system of the present invention does not dispense mixture that is out of specification, unlike Hathorn that continuously dispenses the composite mixture via conduit means 6. (Col. 2, lines 67-69).

Because Hathorn does not disclose, teach or suggest a system with the drain port and controller recited in amended claim 1, claim 1 patenatably distinguishes over Hathorn. Claims 2-3 and 6 depend from claim 1 and patenably distinguish over Hathorn for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Hathorn also fails to disclose, teach, or suggest a system as recited in amended claim 13, wherein there is a means for adjusting the rate at which the second component is added to the blend chamber to achieve a first desired concentration of the mixture for a first predetermined period of time and a second desired concentration of the mixture for a second predetermined period of time. Instead, the controller recited by Hathorn adjusts the flow rate of sand to the blend chamber, in response to a signal from a density meter to maintain a predetermined density level of the composite mixture, by simply adjusting the position of valve 16. (Col. 3, lines 26-41). As noted above, Hathorn adjusts the flow of the sand on a continuous basis and not to achieve different desired concentrations at different time intervals.

Because Hathorn fails to disclose, teach, or suggest a means for adjusting the rate at which the second component is added to the blend chamber to achieve a first desired concentration of the mixture for a first predetermined period of time and a second desired concentration of the mixture for a second predetermined period of time, claim 13 patentably distinguishes over Hathorn. Claims 14-15 depend from claim 13 and patenably distinguish over

PAGE 14/24 * RCVD AT 11/9/2005 4:33:43 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/34 * DNIS:2738300 * CSID: * DURATION (mm-ss):09-36

Hathorn for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Finally, Applicants disagree that claims 7-12 are anticipated by Hathorn. Claim 7 recites the step of providing a first material in bulk to a blend chamber. Hathorn fails to disclose, teach, or suggest a method of blending wherein a first material is provided in bulk to a blend chamber. As noted above, Hathorn discloses a continuous blend and dispense process to provide a composite mixture of oil and sand to a well head. Unlike in the batch process of the present invention, neither the oil nor sand is initially provided to the blend chamber in bulk. According to Hathorn, "the flow of the liquid component entering the system, which is determinative of the solid component inflow, is regulated to maintain the combined component inflow entering the system equal to the medium outflow." (Col. 2, lines 17-20; col. 4, lines 10-20). Further, the flow rate of sand to the blend chamber is controlled to maintain a predetermined density level of the composite mixture. (Col. 3, lines 26-41).

Because Hathorn fails to disclose, teach, or suggest a step of providing a first material in bulk to a blend chamber, claim 7 patenably distinguishes over Hathorn. Claim 8-12 depend from claim 7 and patentably distinguish over Hathorn for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Rejections Under 35 U.S.C. § 103(a)

The Office Action rejected claims 1-15 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 5,516,423 to Conoby et al. (hereinafter "Conoby") in view of Hathorn.

Conoby is directed to a continuous stirred tank reactor (CSTR) for the treatment and discharge of liquid, such as aqueous waste effluent. More specifically, Conoby is directed to a variable residence time treatment system to manage sudden spikes in the flow rate and concentration of liquid to be treated. (Col. 1, lines 6-12; col. 4, lines 13-22). A stream of liquid to be treated is received by reactor tank 12 at inlet port 18 and exits via discharge port 63, the position of which establishes the minimum holding volume of reactor tank 12. (Col. 6, lines 55-56). Sensor 22 positioned in reactor tank 12 provides a pH signal 23 to controller 30. (Col. 5, lines 26-27). Output of controller 30 actuates metering pumps 36, 40 to control the feed of

PAGE 15/24 * RCVD AT 11/9/2005 4:33:43 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/34 * DNIS:2738300 * CSID: * DURATION (mm-ss):09-36

reagents to reactor tank 12 in order to achieve a predetermined pH level of the liquid. (Col. 5, lines 52-59; col. 7, lines 8-10).

One skilled in the art would not have been motivated to combine Conoby and Hathorn in the manner suggested by the Examiner to arrive at the present invention. Upon reading Conoby, one skilled in the art would not have substituted the metering pumps of Conoby with the valves of Hathorn. In fact, Conoby cites benefits of its reagent pumps in stating, "reagent pumps 36 and 40 preferably provide highly variable and controllable flow rates, for example 100:1 or greater turndown ratios, to allow precise and flexible response to liquid treatment conditions." (Col. 6, lines 1-4). There is no indication that the valves shown by Hathorn would meet these specifications. Furthermore, one skilled in the art would not have been motivated to remove the metering pumps of Conoby since without the pumps, there would be no way to provide the reagents to tank 22. One skilled in the art would have had to replace each metering pump with pumps in addition to the valve.

Moreover, one skilled in the art would not have been motivated to provide a batch mixing system upon reading Conoby. According to Conoby, "batch reactor systems are disadvantaged in that they typically require greater holding volume than do CSTR systems." (Col. 1, lines 26-27). Conoby further states, "[i]n accordance with the invention, a single-tank CSTR system can be used with its attendant cost and space savings, for treating a liquid stream of variable volume, composition and/or concentration." (Col. 4, lines 15-19). One skilled in the art would have been directed away from the batch system of the present invention, not toward it.

Finally, even if Conoby and Hathorn were combined in the manner suggested by the Examiner, Applicant's claims patentably distinguish over the proposed combination. Neither Conoby nor Hathorn teach or suggest a batch mixing system comprising the drain port and controller as recited in amended claim 1. With regard to claim 7, neither Conoby nor Hathorn teach or suggest providing a first material in bulk to a blend chamber. Furthermore, neither Conoby nor Hathorn teach or suggest a means for adjusting the rate at which the second component is added to the blend chamber to achieve a first desired concentration of the mixture for a first predetermined period of time and a second desired concentration of the mixture for a second predetermined period of time as recited in amended claim 13. As such, Hathorn fails to cure the deficiencies of Conoby.

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Accordingly, independent claims 1, 7 and 13 are patentable over Conoby and Hathorn either alone or in combination. Claims 2-6, depend from claim 1 and are patentable for at least the same reasons as claim 1. Claims 8-12 depend from claim 7 and are patentable for at least the same reasons as claim 7. Claims 14-15 depend from claim 13 and are patentable for at least the same reasons as claim 13. Accordingly, withdrawal of this rejection is respectfully requested.

The Office Action rejected claims 1-15 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 6,923,568 or, alternatively, US 2002/0048213 of the same family, to Wilmer et al. (hereinafter collectively "Wilmer") in view of Hathorn.

Wilmer is directed to a method and apparatus for blending and supplying process materials, particularly ultra-high purity chemicals, abrasive slurries and the like. (Col. 1, lines 11-14). Process materials from material supply lines 18 may continuously pass into static mixer 22 for mixing. (Col. 12, lines 36-37). Instruments, such as a densitometer, may be positioned upstream of the static mixer to assure acceptable material is being transmitted to the static mixer 22. (See Col. 7, lines 27-30). The blend of process materials may be supplied on a continuous basis, without interruption. (Col. 5, lines 2-4).

One skilled in the art would not have been motivated to combine Wilmer and Hathorn in the manner suggested by the Examiner to arrive at the present invention. Upon reading Wilmer, one skilled in the art would not have provided a recirculation line in static mixer 22 nor would one skilled in the art have relocated the pH sensor to such a recirculation line as shown by Hathorn. Wilmer monitors process material inputs upstream of static mixer 22 as part of a continuous blending and dispensing process. Information collected from a sensor located in the proposed recirculation line in static mixer 22 of Wilmer would be useless. The mixture in mixer 22 of Wilmer cannot be further adjusted if it is out of specification, because it continuously exits the mixer. Wilmer can adjust the input of materials to change the so that the blend leaving mixer 22 eventually changes, but only after sufficient time has passed for the input to pass to the outlet under continuous operating conditions. Even if a sensor in a proposed recirculation line were to detect an out of specification blend, the system of Wilmer could not interrupt flow of the out of specification blend out mixer 22 and adjusts the blend already in mixer 22. Because blended material continuously exits the static mixer in Wilmer regardless of whether a predetermined endpoint has been achieved, there is no motivation to accurately measure a

PAGE 17/24 * RCVD AT 11/9/2005 4:33:43 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/34 * DNIS:2738300 * CSID: * DURATION (mm-ss):09-38

characteristic of the mixture in the static mixer. As such, one skilled in the art would not have combined Wilmer and Hathorn.

Furthermore, one skilled in the art would not have been motivated to provide first and second materials to the blend chamber without measuring a mass flow rate of the first and second materials as recited in amended dependent claim 10. The controller recited by Wilmer may operate based on mass or volume flow rates, or a combination thereof. According to Wilmer, "[b]ecause it is typically more accurate, mass flow rates are preferred." (Col. 11, lines 60-63). As such, one skilled in the art would have been directed toward measuring mass flow rates, not away from it.

Finally, even if Wilmer and Hathorn were combined in the manner suggested by the Examiner, Applicant's claims distinguish over the proposed combination.

Neither Wilmer nor Hathorn teach or suggest a batch mixing system comprising the drain port and controller as recited in amended claim 1. As noted above with Hathorn, Wilmer also fails to disclose a controller that provides a control signal, responsive to a detected amount of the second material in the mixture being greater than the desired concentration, to dispense a portion of the mixture at the drain port as recited in amended claim 1. In regard to claim 7, neither Wilmer nor Hathorn teach or suggest providing a first material in bulk to a blend chamber. Furthermore, neither Wilmer nor Hathorn teach or suggest a means for adjusting the rate at which the second component is added to the blend chamber to achieve a first desired concentration of the mixture for a first predetermined period of time and a second desired concentration of the mixture for a second predetermined period of time as recited in amended claim 13. As such, Hathorn fails to cure the deficiencies of Wilmer.

Independent claims 1, 7 and 13 are, therefore, patentable over Wilmer and Hathorn alone or in combination. Claims 2-6, depend from claim 1 and are patentable for at least the same reasons as claim 1. Claims 8-12 depend from claim 7 and are patentable for at least the same reasons as claim 7. Claims 14-15 depend from claim 13 and are patentable for at least the same reasons as claim 13. Accordingly, withdrawal of this rejection is respectfully requested.

Newly presented independent claim 21 is directed to a system for blending at least two materials, comprising: a blend chamber that includes a first inlet to receive a first material, the first inlet being connected to a first valve to control an amount of the first material received at the

PAGE 18/24 * RCVD AT 11/9/2005 4:33:43 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/34 * DNIS:2738300 * CSID: * DURATION (mm-ss):09-36

first inlet, and a second inlet to receive a second material, the second inlet being connected to a second valve to control an amount of the second material received at the second inlet; a recirculation line connected to the blend chamber to receive a mixture of the first material and the second material and provide the mixture of the first material and the second material back to the blend chamber; a sensor, disposed in the recirculation line, to detect the amount of the second material mixed in the mixture of the first material and the second material; and a controller, connected to the sensor and the second valve, responsive to the sensor to provide a control signal to close the second valve in response to a signal from the sensor detecting a first desired concentration of the second material in the mixture; to provide a control signal to the second valve to remain closed for a first predetermined time period; and to provide a control signal to the second valve to adjust the amount of the second material received at the second inlet to achieve a second desired concentration of the second material in the mixture.

Claim 21 patentably distinguishes over Conoby, Hathorn and Wilmer, either alone or in combination. As noted above, none of the references recite a controller, connected to the sensor and the second valve, responsive to the sensor to provide a control signal to close the second valve in response to a signal from the sensor detecting a first desired concentration of the second material in the mixture; to provide a control signal to the second valve to remain closed for a first predetermined time period; and to provide a control signal to the second valve to adjust the amount of the second material received at the second inlet to achieve a second desired concentration of the second material in the mixture. Accordingly, claim 21 is believed to be in allowable condition.

Claim 22 depends from new independent claim 21 and is patentable over the cited combinations for at least the same reasons as claim 21.

Claims 16-17 depend from independent claim 1 and are patentable over the cited combinations for at least the same reasons as claim 1.

Claims 18-19 depend from independent claim 7 and are patentable over the cited combinations for at least the same reasons as claim 7.

Claim 20 depends from independent claim 13 and are patentable over the cited combinations for at least the same reasons as claim 13.

PAGE 19/24 * RCVD AT 11/9/2005 4:33:43 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/34 * DNIS:2738300 * CSID: * DURATION (mm-ss):09-36

Conclusion

In view of the foregoing amendments and remarks, reconsideration is respectfully requested. This application should now be in condition for allowance; a notice to this effect is respectfully requested. If the Examiner believes, after this amendment, that the application is not in condition for allowance, the Examiner is requested to call the Applicants' attorney at the telephone number listed below.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50/2762.

Respectfully submitted,

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